10/579866
IAP9 Rec'd PCT/PTO 18 MAY 2006



# CUTTING UNIT FOR CUTTING CONTINUOUS CIGARETTE RODS

## TECHNICAL FIELD

The present invention relates to a cutting unit for cutting continuous cigarette rods.

## BACKGROUND ART

In the tobacco industry, cigarette manufacturing machines are used which produce and feed at least one continuous cigarette rod axially, in a generally horizontal direction, to a counter-cutting device which cuts the continuous rod into a succession of cigarette portions of given length.

The continuous rod is normally cut using a cutting head of the type described, for example, in GB-2089187, which comprises a cutting drum having a number of substantially radial blades, and rotating about an axis (normally horizontal and at any rate parallel to a plane defined by the continuous rods when dealing with more than one rod) forming, with the travelling direction of the continuous rod, an angle whose size depends on the length of the desired cigarette portions. As explained clearly in GB-1095970, the size of the angle must be

adjustable to permit changes in format, i.e. in the length of the cigarette portions, and ensure the line of interference between each blade and the continuous rod moves, during the cutting operation, at the same speed as the continuous rod, so that the cut is perfectly crosswise to the axis of the continuous rod at all times.

As described, for example, in GB-2089187, to adjust the angle, the cutting head is mounted to rotate, with respect to a support, about an adjustment axis through the counter-cutting device, perpendicular to the axis of rotation of the cutting drum, and crosswise to the travelling direction of the continuous rod, and can be locked releasably in any desired angular position about the adjustment axis.

In all known cutting heads, locking, releasing, and rotating the cutting head about the adjustment axis call for a series of manual operations, which mean relatively prolonged machine stoppages, as well as painstaking and, at times, relatively inaccurate adjustment.

## DISCLOSURE OF INVENTION

It is an object of the present invention to provide a cutting unit designed to eliminate the aforementioned drawbacks in a straightforward, relatively low-cost manner.

According to the present invention, there is provided a cutting unit for cutting continuous cigarette rods, as claimed in Claim 1 and, preferably, in any one of the following Claims depending directly or indirectly

on Claim 1.

## BRIEF DESCRIPTION OF THE DRAWINGS

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a top, three-quarter view in perspective of a preferred embodiment of the cutting unit according to the present invention;

Figure 2 shows an underside, three-quarter view in perspective of part of the Figure 1 cutting unit;

Figure 3 shows a larger-scale view, with parts removed for clarity, of a detail in Figure 2;

Figure 4 shows a partly sectioned side view of the Figure 3 detail.

## BEST MODE FOR CARRYING OUT THE INVENTION

Number 1 in Figures 1 and 2 indicates as a whole a cutting unit for cutting cigarette portions 2 of given length from two parallel continuous cigarette rods 3 produced on a known dual-rod manufacturing machine (not shown) supporting cutting unit 1.

With reference to Figure 1, continuous rods 3 are fed simultaneously at a given speed to a counter-cutting device 4 forming part of cutting unit 1 and defined in known manner by two sleeves 5, which move back and forth in a travelling direction 6 of continuous rods 3, and have respective slits 7 lying in the same plane, crosswise to direction 6, and engaged successively by a known blade 8 of cutting unit 1.

In addition to counter-cutting device 4, cutting unit 1 also comprises a supporting body 9, which, by means of a lateral connecting plate 10, is connected integrally to a fixed frame (not shown) of the manufacturing machine (not shown), projects from said frame (not shown), and is bounded at the top by a horizontal plate 11 supporting a known cutting head 12.

With reference to Figure 1, cutting head 12 comprises a casing 13 having a base plate 14 fitted to plate 11; and a cutting drum 15 projecting laterally from casing 13, and fitted to casing 13 to rotate, anticlockwise in Figure 1, about an axis 16 by means of a shaft 17 housed inside casing 13 and driven by a main motor (not shown) of the manufacturing machine (not shown). Along its outer periphery, cutting drum 15 supports a number of cylindrical, substantially radial cores 18 (only one shown in Figure 1), which are adjustable angularly about respective axes 19, and are fitted on their respective outer ends with respective known, substantially radial blades 8.

To adjust the angle formed by axis 16 with travelling direction 6, i.e. to adjust the tilt of blades 8 with respect to sleeves 5, as a function of the format, i.e. length, of cigarette portions 2 to be produced, cutting head 12 is fitted to supporting body 9 to rotate, with respect to supporting body 9, about an adjustment axis 20 (Figure 1) through counter-cutting device 4 and perpendicular to the mating plane of base plate 14 and

plate 11, to the travelling direction 6 of continuous rods 3, and to a plane defined by continuous rods 3. For this purpose, cutting unit 1 comprises a guide device 21 for guiding cutting head 12 about adjustment axis 20; an actuating device 22 for moving cutting head 12 about adjustment axis 20 with respect to supporting body 9; a detecting device 23 for determining the instantaneous angular position of cutting head 12 about adjustment axis 20, to permit negative feedback control of actuating device 22; and a releasable locking device 24 for locking cutting head 12, with respect to supporting body 9, in any desired angular position about adjustment axis 20.

As shown in Figure 3, guide device 21 comprises a rib 25 projecting upwards from plate 11 and extending, on plate 11, along an arc coaxial with adjustment axis 20; and a slot 26 formed through base plate 14, extending along an arc coaxial with adjustment axis 20 and of the same radius as the arc of rib 25, and engaged in sliding manner by rib 25.

As shown in Figure 2, actuating device 22 comprises a motor reducer 27 fitted to supporting body 9, beneath plate 11, and comprising an output shaft 28, which is perpendicular to plate 11, extends in rotary manner (Figure 3) through a sleeve 29 integral with supporting body 9, and through a hole (not shown) formed through plate 11, extends inside casing 13 through an opening 30 formed through base plate 14, and is fitted, above base plate 14 and inside casing 13, with a pinion 31 which

meshes with the outer teeth of a ring gear 32 integral with casing 13 and coaxial with adjustment axis 20.

As shown more clearly in Figure 2, detecting device 23 comprises a scale 33 printed on a curved lateral surface 34, coaxial with adjustment axis 20, of base plate 14; and an optical reader 35, preferably a laser reader, positioned radially with respect to lateral surface 34, and for determining, on scale 33, the angular position, with respect to an origin, of cutting head 12 about adjustment axis 20, so as to negative-feedback-control motor reducer 27. Detecting device 23 as described above may obviously be replaced by any equivalent device, e.g. a straightforward encoder (not shown) fitted to shaft 28.

As shown in Figures 3 and 4, locking device 24 comprises two pairs of pins 36 (theoretically, even only one pin 36 is sufficient), each of which is fitted in axially sliding manner through a relative hole 37 formed through plate 11, and has an end plate 38 above plate 11. In each pair of pins 36, the portions of pins 36 projecting above plate 11 engage and slide transversely inside a T-section groove 39, which opens at one end at a lateral edge of base plate 14, and comprises (Figure 3) two end portions 40a, 40b connected to each other, and each of which is engaged by a respective pin 36 and extends along a respective arc coaxial with adjustment axis 20. Each groove 39 comprises a rectangular-section channel 41 engaged in sliding manner by end plates 38 of

relative pins 36; and a slot 42, which extends centrally along relative channel 41, is engaged in transversely sliding manner by respective top end portions of relative pins 36, and defines, beneath channel 41, two shoulders 43 extending along and on opposite sides of slot 42, and between relative end plates 38 and plate 11.

Beneath plate 11, each pin 36 comprises a threaded portion 44 fitted with a ring nut 45 for preloading a pack of disk springs 46 interposed between ring nut 45 and a bottom surface of plate 11 to draw end plates 38 downwards and grip relative shoulders 43 against plate 11 to normally keep cutting head 12 locked contacting supporting body 9.

An end portion of each pin 36, opposite the portion supporting relative end plate 38, projects from the bottom of relative ring nut 45 to define a tappet 47 cooperating with a cam-type release device 48, which forms part of locking device 24, is common to all of pins 36, and, when activated, opposes the locking action of disk springs 46 on relative pins 36 to allow cutting head 12 to move about adjustment axis 20 under the control of motor reducer 27.

As shown in Figure 4, release device 48 comprises, for each pin 36, a U-shaped bracket 49, which is located beneath plate 11 with its concavity facing upwards, is connected integrally to plate 11, and houses the portion of relative pin 36 projecting beneath plate 11. Brackets 49 of two pins 36 in the same pair of pins 36 support for

rotation respective opposite ends of a rod 50 extending crosswise to relative pins 36 and fitted with two cams 51, each of which cooperates with a respective tappet 47 to lift relative pin 36 and release cutting head 12 with respect to supporting body 9, when rod 50 is set to a given angular work position about its own axis 52.

As shown more clearly in Figure 3, rods 50 are rotated, about respective axes 52, between said relative angular work positions and relative angular rest positions by a linear actuator 53 (Figure 2), an output rod 54 of which extends crosswise to rods 50 and is hinged to an intermediate point of a crank 55 fitted to one of rods 50 and forming part of an articulated quadrilateral 56, a further crank 55 of which is fitted to the other rod 50 and connected to the other crank 55 by a connecting rod 57.

Operation of cutting unit 1 is clear from the foregoing description, with no further explanation required. Suffice it to say that, to change format, the new format data is sent to a central control unit 58, which (though not shown graphically in Figure 2 for the sake of simplicity) activates linear actuator 53 to release cutting head 12 with respect to supporting body 9, and then activates motor reducer 27 to rotate cutting head 12 as required about adjustment axis 20 and under negative feedback control of optical reader 35. Once the new angular position is set, central control unit 58 automatically deactivates motor reducer 27, and

reactivates linear actuator 53 to lock cutting head 12 to supporting body 9 in the new angular position about adjustment axis 20.